IN THE SPECIFICATION

Please amend pages 3 & 4 and amend page 8 to read as follows:

Page 3:

BRIEF SUMMARY OF THE INVENTION.

Accordingly, in a first aspect of the invention there is provided an apparatus providing and circulating to a medical device a medical gas mixture comprising at least two components, said apparatus comprising:-

a main gas circuit for recirculating the medical gas and comprising:-

a constant speed circulation pump for pumping gas through the main circuit and increasing the gas pressure from a lower pressure to a higher pressure,

a pressure maintaining valve downstream of the pump and dividing the main circuit into a higher pressure section and a lower pressure section in order to maintain a constant pressure in the higher pressure section,

a medical gas outlet in the higher pressure section,

a spent gas inlet in the lower pressure section,

a first feed gas supply inlet~~, preferably located~~ in the higher pressure section,

a second feed gas supply inlet~~, preferably located~~ in the higher pressure section downstream of the medical gas outlet and upstream of the pressure reduction valve,

a concentration determining means for measuring the concentration of at least one component of the recirculating medical gas mixture in the main circuit and generating a signal indicative of said concentration,

circuit volume regulating means for varying the volume of the main circuit at a location in the lower pressure section for maintaining a predetermined gas flow to the pump and generating a signal indicative of said volume, and

means for venting gas from the main circuit;

a first feed gas supply conduit for supply to the first feed gas inlet of a first feed gas of predetermined composition;

first feed gas supply flow control means for controlling the flow of first feed gas through the first gas supply conduit in response to the signal from the

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Page 4:

concentration determining means to maintain constant the medical gas composition at the pump inlet;

a second feed gas supply conduit for supply to the second feed gas inlet of a second feed gas of predetermined composition different from the first feed gas;

second feed gas supply flow control means for controlling the flow of second feed gas through the second gas supply conduit in response to the signal from the circuit volume regulating means to maintain constant the recirculating medical gas composition; and

a medical device supply circuit for connecting the medical device to the main circuit to receive a portion of the medical gas from the medical gas outlet thereof and to return spent gas to the spent gas inlet thereof and comprising:

flow control means in the medical device supply circuit for controlling flow of the medical gas to the medical device and

purification means in the medical device supply circuit for removing contaminant(s) from the spent gas.

In another aspect, the invention provides a medical device system comprising a medical device connected to the medical device supply circuit of an apparatus of the first aspect *supra*.

In a third aspect, the present invention provides a method of providing a medical device with a medical gas mixture comprising at least two components, said method comprising:-

recirculating the medical gas mixture in a main circuit by a constant speed circulation pump to provide having a higher pressure section maintained at constant pressure in series with a lower pressure section;

withdrawing a portion of the medical gas mixture from the higher pressure section and feeding said portion to the medical device;

removing contaminant(s) from the spent gas mixture from the medical device and returning the decontaminated spent gas to lower pressure section;

measuring the concentration of at least one component in the recirculating medical gas mixture in the main circuit and generating a concentration signal indicative of said concentration;

replenishing components in the medical gas mixture by addition of feed gases to the higher pressure section to maintain the recirculating medical gas composition constant, a first feed gas being supplied through a first feed gas supply inlet and a second feed gas of predetermined composition different from the first feed gas being supplied through a second feed gas inlet; and

varying the volume of the main gas circuit at a location in the lower pressure section to maintain ~~the~~ a predetermined gas flow ~~therein~~ to the pump and generating a volume signal indicative of said volume

the flow of gas through the first feed gas supply inlet being controlled in response to the signal concentration to maintain constant the medical gas composition at the pump inlet and

the flow of gas through the second feed gas supply inlet being in response to the volume signal to maintain constant the recirculating medical gas composition.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S).

Figure 1 is a diagrammatical representation of an apparatus according to one embodiment of the present invention for providing a xenon/oxygen mixture to a cardiopulmonary bypass oxygenator.

Figure 2 is a diagrammatical representation of a ventilator circuit for introduction into the apparatus of Figure 1 to replace the cardiopulmonary bypass oxygenator.

Figure 3 is a diagrammatical representation of another ventilator circuit for introduction into the apparatus of Figure 1 to replace the cardiopulmonary bypass oxygenator.

Figure 4 is a diagrammatical representation of an apparatus according to another embodiment of the present invention for selectively providing a xenon/oxygen mixture to a cardiopulmonary bypass oxygenator and an artificial ventilator.

DETAILED DESCRIPTION OF THE INVENTION.

In a first aspect, the present invention is an apparatus for providing and circulating to a medical device a medical gas mixture comprising at least two components, said apparatus comprising:-

a main gas circuit for recirculating the medical gas mixture and comprising:-

a constant speed circulation pump for pumping gas through the main circuit and increasing the gas pressure from a lower pressure to a higher pressure,

a pressure maintaining valve downstream of the pump and dividing the main circuit

into a higher pressure section and a lower pressure section in order to maintain a constant pressure in the higher pressure section,

a medical gas outlet in the higher pressure section,

a spent gas inlet in the lower pressure section,

a first feed gas supply inlet in the higher pressure section,

a second feed gas supply inlet in the higher pressure section downstream of the gas outlet and upstream of the pressure reduction valve,

concentration determining means for measuring the concentration of at least one component of the recirculating medical gas mixture in the main circuit and generating a signal indicative of said concentration,

circuit volume regulating means for varying the volume of the main circuit at a location in the lower pressure section for maintaining a predetermined gas flow to the pump and generating a signal indicative of said volume, and

means for venting gas from the main circuit;

a first feed gas supply conduit for supply to the first feed gas inlet of a first feed gas of predetermined composition;

first feed gas supply flow control means for controlling the flow of first feed gas through the first gas supply conduit in response to the signal from the concentration determining means to maintain constant the medical gas composition at the pump inlet;

a second feed gas supply conduit for supply to the second feed gas inlet of a second feed gas of predetermined composition different from the first feed gas;

second feed gas supply flow control means for controlling the flow of second feed gas through the second gas supply conduit in response to the signal from the circuit volume regulating means to maintain constant the recirculating medical gas composition; and

a medical device supply circuit for connecting the medical device to the main circuit to receive a portion of the medical gas from the medical gas outlet thereof and to return spent gas to the spent gas inlet thereof and comprising:

flow control means in the medical device supply circuit for controlling flow of the medical gas to the medical device and

purification means in the medical device supply circuit for removing contaminant(s) from the spent gas.

In a second aspect, the present invention is a medical device system comprising a medical

device connected to the medical device supply circuit of the apparatus of the first aspect.

Preferably, the pressure maintaining valve is a spill valve; i.e. a valve which opens wider in response to increased pressure to pass more gas into the lower pressure section and thereby maintain the pressure in the higher pressure section. However, the valve could be a conventional pressure reduction valve.

Preferably, the circuit volume regulating means comprises expansion bellows and the means for generating a signal indicative of the volume thereof suitable is an infra-red level or, preferably, ultrasonic sensor for detecting the level of the expansion bellows in an expandable direction thereof.

Page 8:

whereby a patient can readily be ventilated immediately before and after cardiopulmonary bypass.

In a third aspect of the invention, there is provided a method of providing a medical device with a medical gas mixture comprising at least two components, said method comprising:-

recirculating the medical gas mixture in a main circuit by a constant speed circulation pump to provide having a higher pressure section maintained at constant pressure in series with a lower pressure section;

withdrawing a portion of the medical gas mixture from the higher pressure section and feeding said portion to the medical device;

removing contaminant(s) from the spent gas mixture from the medical device and returning the decontaminated spent gas to the lower pressure section;

measuring the concentration of at least one component in the recirculating medical gas mixture in the main circuit and generating a concentration signal indicative of said concentration;

replenishing components in the medical gas mixture by addition of feed gases to the higher pressure section to maintain the recirculating medical gas composition constant, a first feed gas being supplied through a first feed gas supply inlet and a second feed gas of predetermined composition different from the first feed gas being supplied through a second feed gas inlet; and

varying the volume of the main gas circuit at a location in the lower pressure section to maintain ~~the~~ a predetermined gas flow ~~therein~~ to the pump and generating a volume signal

indicative of said volume;

the flow of gas through the first feed gas supply inlet being controlled in response to the signal concentration to maintain constant the medical gas composition at the pump inlet and

the flow of gas through the second feed gas supply inlet being in response to the volume signal to maintain constant the recirculating medical gas composition.

Preferably, the method comprises operating a medical device system in accordance with the second aspect of the present invention.

In a fourth aspect of the invention, there is provided a method for the extracorporeal treatment of blood by contacting blood with a recirculating medical gas mixture in a device provided with the medical gas mixture using the method of the third aspect of the invention.

The gaseous composition for use in the present invention preferably contains at least one high value gas, which it would be beneficial to recover after use in the process. Such gases include the noble gases, especially xenon, krypton and neon or isotopes thereof, or stable isotopes of gases such as oxygen and carbon dioxide.
